PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : G11B 20/02, H04N 5/76, 5/91 — A1

(11) International Publication Number: WO 96/31878

(43) International Publication Date: 10 October 1996 (10.10.96)

(21) International Application Number: PCT/AU96/00193

(22) International Filing Date: 4 April 1996 (04.04.96)

(30) Priority Data:

PN 2270	7 April 1995 (07.04.95)	AU
PN 2499	21 April 1995 (21.04.95)	AU
PN 5424	14 September 1995 (14.09.95)	AU
PN 6145	25 October 1995 (25.10.95)	AU

(81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published
With international search report.

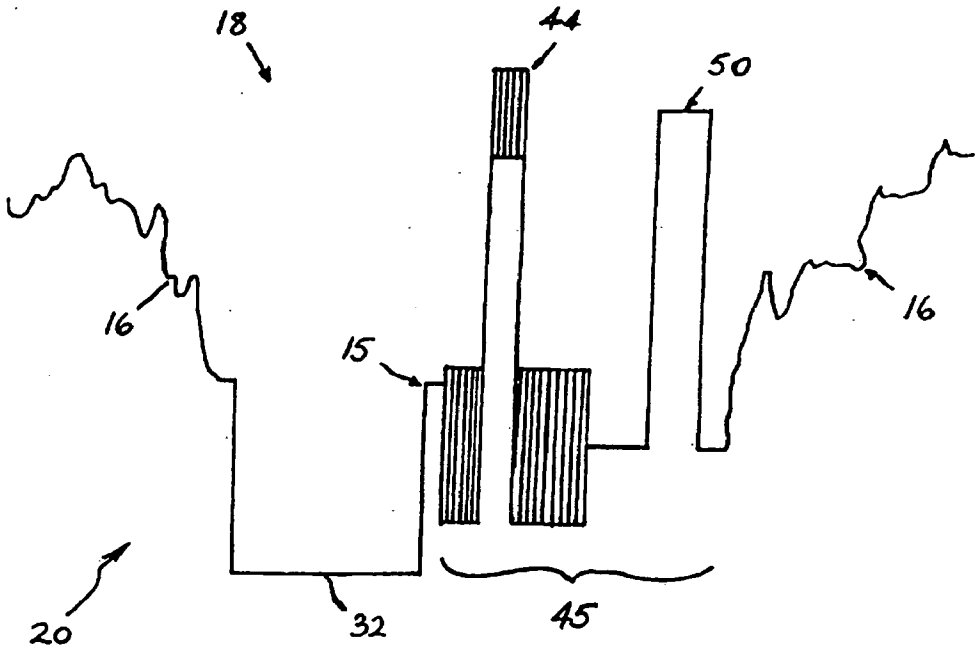
(71)(72) Applicant and Inventor: FRANKLIN, Trevor [AU/AU]; 95 Connemara Drive, Thornlie, W.A. 6108 (AU).

(74) Agents: HARWOOD, Errol, John et al.; Wray & Associates, 239 Adelaide Terrace, Perth, W.A. 6000 (AU).

(54) Title: METHOD AND APPARATUS FOR TREATING A VIDEO SIGNAL

(57) Abstract

A method of treating a video signal to allow playing on a video cassette recorder (VCR) but not to allow copying using a VCR having an automatic gain control (AGC) when recording. The method involves inserting one or more pulses (22) into the back porch (45) during the horizontal blanking interval and attenuating the last lines (24) of the picture information portion (16) and horizontal synchronisation information (18) at the end of each alternate frame. The pulses (22) comprise a pulse signal (44) inserted into the colour burst information portion (34), an opposing pulse signal (45) having a magnitude sufficient to offset the change in the dc level of the colour burst portion (34), caused by the pulse signal (44), and a further pulse (50) inserted somewhere from the last half of the remainder of the back porch (45) to the end of the start of the picture information portion (16). Consequently, the dc level of the colour burst information portion (34) is always maintained at the same level as it was prior to the insertion of the pulses (20). A particular encoder (52) is also disclosed together with a method and apparatus (101) for decoding a video signal treated in the aforementioned manner so as to recover the original video signal.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AM	Armenia	GB	United Kingdom	MW	Malawi
AT	Austria	GE	Georgia	MX	Mexico
AU	Australia	GN	Guinea	NE	Niger
BB	Barbados	GR	Greece	NL	Netherlands
BE	Belgium	HU	Hungary	NO	Norway
BF	Burkina Faso	IE	Ireland	NZ	New Zealand
BG	Bulgaria	IT	Italy	PL	Poland
BJ	Benin	JP	Japan	PT	Portugal
BR	Brazil	KE	Kenya	RO	Romania
BY	Belarus	KG	Kyrgystan	RU	Russian Federation
CA	Canada	KP	Democratic People's Republic of Korea	SD	Sudan
CF	Central African Republic			SE	Sweden
CG	Congo	KR	Republic of Korea	SG	Singapore
CH	Switzerland	KZ	Kazakhstan	SI	Slovenia
CI	Côte d'Ivoire	LI	Liechtenstein	SK	Slovakia
CM	Cameroon	LK	Sri Lanka	SN	Senegal
CN	China	LR	Liberia	SZ	Swaziland
CS	Czechoslovakia	LT	Lithuania	TD	Chad
CZ	Czech Republic	LU	Luxembourg	TG	Togo
DE	Germany	LV	Latvia	TJ	Tajikistan
DK	Denmark	MC	Monaco	TT	Trinidad and Tobago
EE	Estonia	MD	Republic of Moldova	UA	Ukraine
ES	Spain	MG	Madagascar	UG	Uganda
FI	Finland	ML	Mali	US	United States of America
FR	France	MN	Mongolia	UZ	Uzbekistan
GA	Gabon	MR	Mauritania	VN	Viet Nam

TITLE: "METHOD AND APPARATUS FOR TREATING A VIDEO SIGNAL"

TECHNICAL FIELD

This invention relates to a method and apparatus for treating a video signal and decoding the same. The invention has particular utility in the treatment of video signals and the provision of video tapes for normal consumption by way of sale or hire having a treated video signal thereon which limits the possibility of making an acceptable copy of the treated video signal on to another video tape using a standard video signal recording system (VCR), having an automatic gain control (AGC) for adjusting the video signal level during recording thereof, whilst allowing for normal playing and viewing of the videotape having the original treated signal thereon. The invention also has utility with respect to the decoding of such treated video signals to allow reconstitution of the original video signal in certain situations where this may be necessary.

In a standard phase alternating line (PAL) video signal, there are 312 and one half lines per field, whereby two fields are displayed in succession in an interlaced manner to generate one complete picture. Consequently, there are 625 separate raster lines on a screen making up one complete picture. For the purposes of the present invention, a frame is defined to constitute a single field, two frames being required to be displayed one after the other in an interlaced manner to make up a complete picture.

BACKGROUND ART

Methods and apparatuses for treating a video signal to prevent unauthorised recordings thereof have been described in the past. For example, US Patent Specification No. 4,163,253 by Sony describes a method and an apparatus for treating a video signal to prevent satisfactory video picture reproduction as a result of further recording the treated video signal using a VCR having an AGC used in the recording process. The method employed by the Sony patent relies

upon inserting a pulse signal into the back porch of the horizontal synchronisation pulse having an amplitude that is much greater than the peak white level of a VCR on which it may be recorded, and which pulse signal is used to upset the normal operation of the AGC of the VCR recording the treated signal. The specification provides a good overview of the conceptual operation of AGCs used during the recording operation of normal VCRs, which is relevant to the present invention.

Notwithstanding the method and apparatus described in the Sony Patent No. 4,163,253, the described arrangement did not work for reasons outlined in US Patent Specification No. 4819098 by Macrovision. Moreover, as described in the latter patent specification, many television monitors and receivers use the back portion region of the back porch, prior to the picture information portion of the video signal, for black-level clamping. Thus, although the basic principle may have worked in preventing copying of the treated signal by VCRs with AGCs, the treated signal also could not be properly played and viewed on a VCR when the AGC was not being used at all, since the inserted pulse signal interfered with the black-level clamping function of monitors and receivers making the picture black.

Macrovision in their Patent No. 4819098 looked at using the same principle of upsetting the operation of the AGC during unauthorised recordings, but instead of placing the pulse signal within the back porch during the horizontal synchronisation intervals between picture information within a field, which would conflict with the black-level clamping operation of the television monitor or receiver immediately prior to displaying the picture information portion of a line, pulse signals were inserted into only those back porch intervals of the synchronisation pulses, in clusters thereof, during the vertical blanking interval.

A limitation of this technique is that the signals can not be inserted into the horizontal blanking intervals occurring during the scanning of lines of picture information within a field or frame, or any significant number of these. Thus the

pulse signal could only be inserted during the vertical blanking interval at the end of a frame and at the start of the next frame, so as not to unduly deplete the picture image during normal playing of the treated signal.

In the Macrovision technique, however, the reason for the depletion of the picture image during normal playing of the treated signal, was not due to the black-level clamping problem experienced in the Sony technique. Rather, in the Macrovision technique, the pulse signals are specifically inserted into the colour burst portion of the horizontal blanking interval which affects the brightness of the displayed picture. Thus, the resultant technique if used in too many lines of the video signal during a frame, would cause a continuous variation in the brightness of the viewed picture which would upset normal viewing, as opposed to only introducing this effect on copied versions of the treated signal.

One of the reasons for inserting the pulse signal in the colour burst portion was to avoid interfering with the remainder of the back porch as this part of the signal during the vertical blanking interval is used by teletext and data casting systems as well.

Other methods which have similarly tried to prevent the acceptable copying of video tapes produce a phenomenon known as black-level depression. In these methods, the treated video signal's colours which are meant to be grey are represented as black. The treatment of the video signal using this technique is relatively expensive and video tapes employing the same are expensive to purchase and typically require studio quality video recorders to make the original recording. Studio quality video recorders are considerably more expensive than home video recorders or modified home recorders and hence the use of this system is unattractive to video shop outlets who may be permitted to make original recordings in most instances.

DISCLOSURE OF INVENTION

It is an object of the present invention to provide a method and apparatus for treating a video signal for reproduction on a main or master video cassette tape using a modified standard VCR or professional VCR with AGC switched off, whereby the treated video signal substantially prevents or at least mitigates the ability to acceptably copy a video signal therefrom for displaying using a standard VCR having an AGC for adjusting the video signal level during recording but not during play.

It is a further object of the present invention to provide a method and apparatus for treating a video system and decoding the same which overcomes some of the deficiencies or limitations associated with the techniques described in the aforementioned prior art.

In accordance with one aspect of the present invention, there is provided a method for treating a video signal to mitigate the ability of a video signal recording system having an automatic gain control for adjusting the video signal level, copying an acceptable video signal for displaying therefrom, including:

inserting a pulse signal into the video signal during a horizontal blanking interval of a line of the video signal, said pulse signal having a magnitude sufficient to cause the treated video signal to overcompensate the automatic gain control of the video signal recording system; and

biasing a portion of the video signal during said horizontal blanking interval to offset the direct current (dc) voltage shift caused in the video signal by said inserting;

wherein said pulse signal is inserted into a sufficient number of lines of the video signal to cause visual impairment of the reproduced picture information

contained in a copy made of the treated video signal by said video signal recording system.

In accordance with another aspect of the present invention, there is provided a method for decoding a treated video signal as defined in the preceding aspect of the present invention, including:

clamping or switching out the dc voltages of the inserted pulse signals and opposing pulse signals in the treated video signal to the video blanking level; and

stabilising the amplitude of the synchronisation pulses.

In accordance with a further aspect of the present invention, there is provided an apparatus for treating a video signal to mitigate the ability of a video signal recording system, having an automatic gain control for adjusting the video signal level, copying an acceptable video signal for displaying therefrom, including:

receiving means to receive the video signal;

pulse generating means to generate a pulse signal of a prescribed magnitude sufficient to cause the treated video signal to overcompensate the automatic gain control of the video signal recording system when inserted into the video signal;

inserting means to insert said pulse signal into the video signal during a horizontal blanking interval of a line of the video signal; and

biasing means to bias a portion of the video signal during said horizontal blanking interval to offset the dc voltage shift caused in the video signal by said pulse signal;

wherein said inserting means is controlled to insert said pulse signal into a sufficient number of lines of the video signal to cause visual impairment of the reproduced picture information contained in a copy made of the treated video signal by said video recording system.

In accordance with another aspect of the present invention, there is provided an apparatus for decoding a video signal treated in accordance with a method as defined in the first aspect of the present invention or an apparatus as defined in the preceding aspect of the present invention, including:

decoder receiving means to receive the treated video signal;

decoder clamping means to clamp or switch out the dc voltages of the inserted pulse signals and opposing pulse signals in the treated video signal to the video blanking level; and

stabilising means to stabilise the amplitude of the synchronisation pulses.

BRIEF DESCRIPTION OF DRAWINGS

The invention will be better understood in light of the following description of two specific embodiments thereof. The description is made with reference to the accompany drawings, wherein:-

Figure 1 is a diagrammatic representation of a plot of voltage against time of an original untreated video signal on a relatively large time scale showing successive frames of the original untreated video signal separated by vertical blanking intervals;

Figure 2 is a plot of voltage against time of the original untreated video signal on a relatively small time scale showing a horizontal synchronisation pulse and a colour burst signal during the horizontal blanking interval between successive scan lines of the original untreated video signal;

Figure 3 is a diagrammatic representation of a plot of voltage against time of a treated video signal on a relatively large time scale similar to figure 1, but with the addition of pulse signals into the horizontal blanking intervals and the start of the picture information portions of the video signal, and also the attenuation of the last lines of each alternate frame;

Figure 4 is a similar plot to figure 2 but of the treated video signal showing the pulse signal, opposing pulse signal and further pulse signal inserted therein in accordance with the first embodiment;

Figure 5 is a similar drawing to figure 4, but showing the further pulse signal inserted in the back porch of the horizontal blanking interval in an alternative embodiment to the first embodiment of the description; and

Figure 6 is a block diagram showing the encoder apparatus for treating the video signal in accordance with the first embodiment;

Figure 7 is a block diagram of the decoder apparatus in accordance with the second embodiment.

MODES FOR CARRYING OUT THE INVENTION

The first embodiment is directed towards a method of treating a video signal and an encoder apparatus therefor, the video signal being a standard video signal of the type currently being used for recording onto standard video cassette tapes for normal consumption.

As shown in figure 1 of the drawings, a standard video signal 10 is made up of a continuous stream of fields or frames 12. Each frame 12 has vertical synchronisation information 14 provided during a vertical blanking interval 15, picture information 16 provided between the vertical blanking intervals 15, and horizontal synchronisation information 18 which is provided continuously

throughout the vertical blanking intervals 15 and the picture information intervals 16.

As is well known in the art, each frame 12 begins with vertical synchronisation information 14 which denotes the beginning of a frame. The vertical synchronisation information essentially comprises a sequence of pre-equalisation pulses, a sequence of vertical synchronisation pulses and a sequence of post equalisation pulses, followed by an interval in which to set the black-level of the television monitor or receiver. There then follows a plurality of lines of picture information corresponding to horizontal lines on a television screen. Each line of the video signal 10 comprises horizontal synchronisation information 18, contained within a horizontal blanking interval 30, and picture information 16. The horizontal synchronisation information 18 is used to denote the beginning of a line of picture information 16 and is shown in more detail in figure 2 of the drawings.

The effect of the present embodiment is to produce a video signal 20 as shown in figure 3 of the drawings which has been treated in order to prevent acceptable copies being made thereof. Like reference numerals denote like parts of the video signal as shown in figures 1 and 2 of the drawings.

As can be seen from the drawings, the video signal 20 further comprises the addition of various signal pulses 22 in the back porch 36 of the horizontal blanking interval 30 and the start of the picture information 16. These pulses 22 are shown more particularly in figure 4 of the drawings.

Each horizontal blanking interval 30 in the frame 12 is modified by the inclusion of the pulses 22, except in that portion of the vertical blanking interval 15 which comprises the vertical synchronisation pulses 14a and the post equalisation pulses 14b.

The video signal 20 is also treated in a manner so that the picture information 16 and the horizontal synchronisation information 18 are reduced in amplitude in the region 24 at the end of each alternate frame 12, as shown in figure 3. This attenuation of the video signal will be described in more detail later.

As shown in figures 2 and 4 of the drawings, the standard video signal 10 includes a horizontal synchronisation pulse 32 and a colour burst information portion 34, the latter being included on the back porch 36 of the horizontal blanking interval. As is known in the art, the synchronisation pulse 32 is used to synchronise each horizontal line of a frame 12 and the dc level of the colour burst information portion 34 is used by the automatic gain control (AGC) of a standard video cassette recorder (VCR) to scale the signal level of the picture information 36 when recording.

As shown in figure 4 of the drawings, the treated video signal 20 has a pulse signal 44 inserted into the colour burst information portion 34, an opposing pulse signal 45 which is negative relative to the pulse 44 inserted into the back porch 36 and has a pulse width extending from the commencement of the colour burst information portion 34 to the commencement of the picture information signal 16, and a further pulse signal 50 inserted into the start of the picture information portion 16. These pulses 44, 45 and 50 represent pulses 22 shown in figure 3 of the drawings.

The magnitude of pulses 44 and 50 is sufficient to drive the video signal at the portions that they are applied into the peak white level which is clipped by the white clipper circuit of the VCR.

The pulse 44 effectively prohibits acceptable recordings of the treated video signal being made by virtue of its large amplitude in the colour burst information portion 34 by causing the AGC in a VCR which is recording the treated video signal, to overcompensate for the actual amplitude of the picture information 16, believing that it is of considerably larger magnitude as represented by the pulse

44, than it actually is. Consequently, the AGC operates to reduce the amplitude of the picture information 16 in the recorded version of the treated video signal. The further pulse 50 exacerbates the effect on the AGC so that on the recorded copy of the treated video signal 20, the picture information 16 and the synchronisation pulses 32 are of substantially reduced amplitude making the picture displayed during playback of this recorded copy extremely dark and difficult to view. In addition, the attenuated section 24 can cause vertical jitter and horizontal disturbances.

It needs to be appreciated that in order to overcome the problems previously described with respect to the Sony and Macrovision patents, the provision of the opposing pulse signal 45 and the precise positioning of the pulse 50 is important. Moreover, the pulse 45 is inserted to offset the dc shift caused by insertion of the pulse 44 into the colour burst portion of the signal. In this respect, insertion of the pulse 44 into the colour burst information portion 44 changes the average dc level thereof and so if not offset, causes black-level depression or black-level crushing problems on the original recording, as experienced in the Macrovision technique.

The pulse width of the pulse signal 44 is relatively small, being in the order of 0.4 microseconds compared to the width of the colour burst information portion 34, being in the order of 2.5 microseconds. Consequently, the pulse 45 by extending over the remainder of the back porch 36 from the start of the colour burst information portion need only be of a comparatively small amplitude to negative dc bias the colour burst portion 34. Typically, where the peak to peak level of the video information signal is approximately 1 volt the negative amplitude of the opposing pulse 45 may vary from blanking level down to 0.15 volts.

In the present embodiment, the pulse 45 is approximately of 7 microseconds duration and causes a slight negative shift in the entire remainder of the back porch 36 after the colour burst portion 34 as well as in the colour burst portion

34. This is necessary for certain makes of VCR which require dc shifting of the back porch for a period slightly after the end of the colour burst portion.

With respect to the further pulse signal 50, this cannot be situated in the first half of the remainder of the back porch 36 immediately following the colour burst information portion 34 due to the fact that this part of the back porch is used for black-level clamping as well as part of the colour burst detection on certain VCR's as previously described. Accordingly, if the further pulse 50 appeared in this region, it would suffer the same problems as experienced by the Sony technique. Accordingly, locating the pulse 50 at the start of the picture information portion 16 of the signal avoids any possibility of affecting the black-level clamping, and further, as the first lines of the picture information are not displayed on the television monitor or receiver, the further pulse 50 does not affect the picture image in any way.

Consequently, the pulses 44, 45 and 50 all function to prohibit effective duplication of the treated video signal 20 on a normal VCR having an AGC, but have no material effect on the straight playing of the treated video signal which is undertaken without the AGC.

With respect to the region of attenuated synchronisation information 18 and picture information 16, typically this region is in the last five to fifteen lines of every second frame 12. These lines similarly are not usually displayed on the television screen and so their attenuation similarly would have no effect on the picture image seen by the viewer. However, when an attempt is made to duplicate the recorded treated video signal 20, the initial effect of the pulses 22 on the AGC in recording the treated signal cause the amplitude of the picture information 16 and the horizontal synchronisation information 18 to be reduced in amplitude still further in the region 24. This further reduction in amplitude causes the television monitor or receiver to sometimes misinterpret the reduced amplitude of the horizontal synchronisation information 18 in the region 24 as being the commencement of the vertical synchronisation information 14 for the

next frame. Consequently, the effect is to produce a random vertical jittering or jumping of the duplicated signal, further reducing the quality of the recorded copy of the treated video signal 20.

In the present embodiment, as the AGC of different VCRs look at different portions of the colour burst information portion 34 in order to determine the relevant gain, it is necessary for the position of the pulse signal 44 to be varied within the colour burst information portion 44, so as to have an effect at least some of the time on the scanned lines of picture information on the operation of the AGC. Consequently, the method of the present embodiment also envisages varying the position of the pulse signal 44 continuously throughout the colour burst information portion 34 during successive horizontal blanking intervals of the video signal. In addition, the present embodiment involves the pulse signal 44 varying in amplitude from line to line or frame to frame with corresponding adjustments being made to the amplitude of the opposing pulse signal 45 to offset the pulse signal 44 so that the effective dc level of the colour burst information portion remains unaffected. This modulation of the position and amplitude of the pulse 44 produces a flashing effect on a resultant picture produced by playing a copy of the treated video signal made on a standard VCR, further reducing the viewability of the picture information.

As with the pulse signals 44 and 45, the further pulse 50 at the start of the picture information can also vary in amplitude and width from line to line or frame to frame, from peak white level down to video blanking level. The width of the further pulse 50 can also vary from its normal width of approximately 2 microseconds narrower or wider. Ideally, the pulse width of the further pulse 50 would be at least 3 microseconds and extend into the second half of the remainder of the back porch 36 following the colour burst information portion 34. By remaining in the second half of this remainder of the back porch, the black-level clamping performed by the television monitor or receiver remains unaffected and so the problems associated with the Sony technique, are still avoided, whilst maintaining a wider pulse which has a more pronounced

supplementary effect upon the AGC, than would a narrower pulse. In addition, in alternative embodiments of the present invention, the further pulse 50 may reside wholly in the second half of this remainder of the back porch as shown in figure 5 of the drawings, where the same reference numerals have been used to denote like parts of the treated video signal as shown in figure 4 of the drawings.

Now describing the apparatus 52 for producing the treated video signal, there is essentially provided a receiving means, various pulse generating means and biasing means, video signal attenuating means and stabilising means prior to outputting the treated video signal.

As shown in figure 6 of the drawings, the receiving means comprises a back porch clamping circuit 54 and a synchronisation pulse separator 56. The back porch clamping circuit 54 clamps the back porch of the horizontal synchronisation pulses of the incoming video signal to help cancel any ac alternating current (ac) voltage component from the horizontal synchronisation pulses which could cause incorrect synchronisation pulse separation.

The synchronisation pulse separator 56 operates to separate the vertical and horizontal synchronisation pulses from the video signal to use them as a reference point for subsequent operation of the various pulse generating means and biasing means.

The various pulse generating means and biasing means in the present embodiment are divided into independent timing means in the form of monostable multivibrators 58 and pulse generators 60, one of each being provided for the generation of each pulse 22. Thus, a timing circuit 58a and a pulse generator 60a is provided for generating the pulse signal 44, a timing circuit 58b and a pulse generator 60b forming the biasing means to generate the opposing pulse signal 45, and a timing circuit 58c and a pulse generator 60c being provided for generating the further pulse 50.

Accordingly, the synchronisation pulse separator 56 provides a reference signal at its output line 62 triggered on the trailing edge of each horizontal synchronisation pulse received. The reference signal triggers the timing circuit 58a to produce a 1 microsecond delay before it triggers the pulse generator 60a to produce an outward pulse of a width of approximately 0.4 microseconds. The reference signal further triggers the timing circuit 58b to produce a delay of 0.5 microseconds before it triggers the pulse generator 60b to provide an output pulse of a duration of approximately 7 microseconds. Finally, the reference signal at the control line 62 triggers the timing circuit 58c to produce a delay of approximately 7 microseconds before it triggers the pulse generator 60c to produce the source of the further pulse 50 with a delay of anything from 1.5 microseconds to 4 microseconds as required.

The output of the pulse generator 60a is input to a modulation circuit 64 which operates to modulate the output pulse signal in time with approximately a 1 microsecond shift, so as to move the pulse back and forth in the colour burst information portion 34, and in amplitude between the maximum peak value of 1.2 to 1.4 volts and the blanking level. This modulation is achieved with a 0.5 to 2 hertz oscillator 66 which feeds the modulation circuit 64 to shift the pulse in time and amplitude. This shift in the position of the pulse 44 in the colour burst area, as previously described, causes the AGC and the recording VCR to continually change its gain, resulting in any copy of the treated video signal being displayed having the picture image go bright then dark at an annoying rate to watch by the viewer.

The pulse generator 60b is designed to produce a negative pulse to constitute the source of the opposing pulse signal 45, relative to the pulse signal 44. This negatively biases the remaining back porch region of the video signal from 0 down to approximately 0.08 of a volt, relative to the blanking level. If necessary, the resultant opposing pulse signal could go down as far as 0.15 volts to reduce any black-level crushing which may occur.

As previously described, the resultant pulse output by the pulse generator 60c is a positive pulse and is used as a peak level white signal which is placed at the start of the picture information. As with the preceding pulses, this pulse can also vary in amplitude from blanking up to the peak white clip level or even a higher level. Accordingly, the pulse is used to also act against the recording VCR's AGC system to further reduce the amplitude of a copy of the original recording so as to degrade the resultant picture further.

The video signal attenuating means comprises a vertical synchronisation pulse divider 68, an attenuating timing circuit 70 and a pulse generator 72. The vertical synchronisation pulse divider 68 receives a second output signal from the synchronisation pulse separator 56 which issues a reference signal in respect of each occurrence of the vertical synchronisation pulse sequence. Thus, the reference signal provided on the output line 74 is provided at the frame rate, typically 50 hertz. This reference signal is further divided by two to produce a pulse at half frame rate (that is 25 hertz) by the vertical synchronisation pulse divider 68. The output signal from the vertical synchronisation pulse divider is therefore produced at the start of each vertical synchronisation pulse sequence of each alternate frame and is input to the attenuating timing means to cause a delay of one frame period less five to fifteen lines, before triggering the pulse generator 72. Once triggered, the pulse generator 72 generates a pulse at the commencement of the last set of lines and having a pulse width corresponding to the remainder of the scanned picture information lines until the commencement of the next vertical blanking interval. Thus pulses generated by the pulse generator 72 last five to fifteen lines and are used to attenuate the overall video level of these last five to fifteen lines of each alternate frame.

The inserting means comprises a pulse mixer 76 which receives the original video signal after it has been passed through the back porch clamping circuit 54 and an initial video amplifier 78. The pulse mixer 76 inserts the various pulse signals 44, opposing pulse signals 45 and further pulse signals 50 generated by the respective pulse generators 60 and modulation circuit 64. The pulse mixer

76 effectively adds these pulses into the original video signal to produce the treated video signal as shown in figure 4. In order to prevent the pulses 22 being inserted during part of the vertical blanking interval, the apparatus 53 includes a vertical blanking interval suppressing means. The video blanking interval suppressing means essentially comprises an electronic switching means 88 controlled by a pulse generating means comprising a timing circuit 88 and a pulse generator 90 similar to the timing circuits 58 and pulse generator 60. The timing circuit 88, however, is connected to the output control line 74 providing the vertical synchronisation pulse sequence for each frame and provides a delay commensurate to the duration of the pre-equalisation pulses of the vertical blanking interval for triggering the pulse generator 90 to produce an output control pulse which controls the operation of the switching means 88 to stop the input of the generated pulse signal 44, opposing pulse signal 45 and further pulse signal 50 to pulse mixer 76. The duration of the control pulse generated by the pulse generator 90 is commensurate to the duration of the sequence of vertical synchronisation pulses and post equalisation pulses so that at the end of this period, the switching means 88 is closed once more to allow the pulse generator 60 to apply their respective pulses to the pulse mixer 76 for insertion into the video signal.

The resultant video signal from the pulse mixer 76 is buffered by a further video amplifier 80 and is fed through a field attenuating circuit 82 which constitutes the video signal attenuating means for attenuating the last five to fifteen lines of each alternate frame of the video signal as shown at 24 in figure 3. Accordingly, the output pulse of the pulse generator 72 is connected to the field attenuating circuit 82 to effect this attenuation. In the present embodiment, the attenuated section at 24 is adjusted by the field attenuating circuit 82 so that the dc level of a normal blanking level is reduced by 0.5 to 0.1 volts towards the synchronisation pulse tip level.

The output of the field attenuating circuit 82 is passed through a stabilising means in the form of a synchronising pulse tip clamping circuit 84. This circuit

clamps all of the synchronisation pulse tips to the same level to ensure that there are no horizontal synchronisation problems created as a result of the pulse mixing and video signal attenuating performed by the respective circuits 76 and 82.

After passing the treated video signal through the synchronisation tip clamping circuit 84, the treated video signal is amplified by an output video amplifier 86 to provide the treated video signal at the correct voltage levels.

It should be noted that the original recording encoded with the encoder apparatus of the present embodiment would have acceptable picture quality since the average dc level of the colour burst information 34 is unaffected by the treatment of the video signal. Furthermore, it should be noted that no black-level depression or black-level crush would be apparent on a normal television receiver.

Although the above encoder apparatus would perform quite satisfactorily, it should be appreciated that there would be many other circuits which are capable of performing the encoder function of the described apparatus and method, and that such other circuits or apparatus are considered to merely alternative embodiments of the present invention and hence fall well within its scope.

Thus the treated video signal can be satisfactorily reproduced on a master VCR by using a professional VCR with the AGC switched off or a modified VCR having the same effect. Accordingly, with the AGC switched off, it is imperative to ensure that the treated video signal being recorded is presented at the correct voltage levels which would otherwise be controlled by the AGC. Nonetheless, in applications where it is desirable to allow the treated video signal 20 to be recorded once, but that further recordings from this main recorded copy be prohibited, the present embodiment has great utility. Such applications would include video stores which are allowed under license to duplicate video cassettes. In this situation it would be desirable to physically prevent persons

renting video cassettes to be able to duplicate the recording using standard VCRs, and at the same time be further desirable for the treated video signal 20 to be recorded by the video store proprietor without using a studio quality VCR.

Whilst the aforementioned method and apparatus of the first embodiment can effectively be used to reduce video piracy, in some instances it will be necessary for people who are licensed to encode such tapes to produce treated video signals therefor, to also be able to decode these encoded tapes. Video libraries with damaged encoded video tapes that are used for hire may need repair and the proprietors thereof may be licensed to decode and re-encode these tapes under such license.

Other areas such as satellite television, may require encoding of this signal, but also require a remote decoder so that the received signal can be recorded at a specified station but prevent other viewers recording the program illegally.

Accordingly, the second embodiment is directed towards a method for decoding the treated video signal as described in the preceding embodiment and a decoder apparatus for performing such method.

In the present embodiment, the method of decoding the treated video signal involves regenerating the original amplitudes for the synchronisation pulses, generating a wide clamping pulse and clamping incoming video signals to a reference level during the application of such a pulse, automatically controlling video output levels and stabilising the reconstituted video signal by clamping the output synchronising levels to a reference level.

As shown in figure 7 of the drawings a decoder apparatus 101 essentially comprises decoder receiving means to receive the treated video signal, decoder clamping means to clamp out the dc voltages of the inserted pulse signals, detecting means to detect the attenuated amplitude of the video signal, amplifying means to restore the relevant amplitude levels to their correct video

levels and stabilising means to stabilise the resultant amplitude of the synchronisation pulses.

The decoder receiving means comprises a synchronisation pulse separator 103, substantially identical to the synchronisation pulse separator 56 of the preceding embodiment, with the exception that only the horizontal synchronisation pulses are of concern.

The decoder clamping means includes a decoder timing circuit comprising a first monostable multivibrator 105, a second monostable multivibrator 107 and a clamping amplifier 109. The first monostable 105 is triggered by the trailing edge of the horizontal synchronisation pulse signal output by the synchronisation pulse separator 103. The monostable 105 produces a pulse with a width of approximately 0.5 microseconds to create a delay commensurate to the time it takes for the colour burst information portion 34 to be propagated on the treated video signal. This output signal triggers the second monostable multivibrator 107 with its trailing edge, to produce a wide clamping pulse. This pulse is used to clamp the dc voltages of the encoded pulses down to the video blanking level by being connected to the clamping amplifier 109. Accordingly, the pulse generated by the monostable 107 is approximately 9 microseconds wide, covering the period of propagation of the opposing pulse signal 45 at the commencement of the colour burst information portion 34, the pulse signal 44 occurring anywhere within the colour burst information portion, and the further pulse signal 50 occurring either in the start of the picture information portion of the treated video signal or in the last half of the remainder of the back porch between the end of the colour burst information portion 34 and the start of the picture information portion 16.

It should be noted that the clamping amplifier 109 may in some cases need to be followed by another clamping amplifier in order to bring the amplitude of the pulse signals 44 and 50 back down to the video blanking level due to the fact

that these pulses are of very high amplitude and can require a large amount of suppression to cancel their effect on the AGC system of a video recorder.

The detecting means comprises a comparator circuit 111 which receives one input via the input line 113 from the output of the synchronisation pulse separator 103 to detect the amplitude of the separated horizontal synchronisation pulse, and a second input derived from the output of the clamping amplifier circuit 109 which is input via the input line 115. Thus, the comparator compares the difference between the blanking level provided at input line 115 with the horizontal synchronisation pulse level provided on input line 113 and uses this voltage differential as a reference to maintain the amplitude of the outgoing horizontal synchronisation pulses to an exact level, which in the present embodiment is 0.3 volts.

The amplifying means comprises an automatic gain control amplifier 119. Accordingly, the output of 117 of the comparator 111 drives the automatic gain control amplifier 119 to amplify the amplitude of the horizontal synchronisation pulses and corresponding picture information portions of the treated video signal to restore the same to the correct video levels as were provided in the original video signal. Thus, the automatic gain control amplifier 119 together with the comparator circuit 111 constitutes amplitude adjusting means which correct the attenuated signal levels of the last five to fifteen lines of each alternate frame to their original levels and adjusts the correct voltage levels of the horizontal synchronisation pulses and the picture information signal, simultaneously.

The stabilising means comprises a synchronisation pulse tip clamping amplifier 121 substantially identical to the amplifier 84 of the preceding embodiment, whereby this amplifier effectively clamps the synchronisation pulse amplitudes at the same level. The restored video signal is then fed to an output amplifier 123 to drive the video output at correct levels into a 75 ohm load as the output from the decoder.

It should be appreciated that there are many other methods available to remove the encoded signals of the treated video signal produced in accordance with the first embodiment. For example, an electronic switch to switch out the further pulse 50 may be used and clamping circuits used only to clamp out the pulse signals 40 and 45. Other methods may not use monostable multivibrators for timing means and instead may use an EPROM integrated circuit to produce similar pulses.

It should be appreciated that the scope of the present invention is not limited to the specific embodiments herein described. Accordingly, modifications and variations of the various apparatus described and methods described which would be apparent to a skilled addressee in the field of the invention are deemed to fall within the scope of the present invention.

CLAIMS

1. A method for treating a video signal to mitigate the ability of a video signal recording system having an automatic gain control for adjusting the video signal level, copying an acceptable video signal for displaying therefrom, including:

inserting a pulse signal into the video signal during a horizontal blanking interval of a line of the video signal, said pulse signal having a magnitude sufficient to cause the treated video signal to overcompensate the automatic gain control of the video signal recording system; and

biasing a portion of the video signal during said horizontal blanking interval to offset the direct current (dc) voltage shift caused in the video signal by said inserting;

wherein said pulse signal is inserted into a sufficient number of lines of the video signal to cause visual impairment of the reproduced picture information contained in a copy made of the treated video signal by said video signal recording system.

2. A method as claimed in claim 1, including:

inserting said pulse signal into the colour burst portion of the video signal during said horizontal blanking intervals, having a width sufficiently less than said colour burst portion to not affect the function of said colour burst portion during normal playing of the video signal;

and said biasing comprising inserting an opposing pulse signal also into said colour burst portion of sufficient magnitude to achieve said offset and maintain the resultant dc voltage level of said colour burst portion of the

treated video signal to the dc voltage level of said colour burst portion in the original video signal.

3. A method as claimed in claim 2, wherein said biasing comprises inserting said opposing pulse signal having a width commensurate to the remainder of the back porch of the horizontal synchronisation pulse from the commencement of said colour burst portion to the commencement of the picture information portion of the video signal.

4. A method as claimed in any one of the preceding claims including inserting a further pulse signal into lines of the video signal having said pulse signal, sometime after the completion of said colour burst portion and before the main displayable portion of the picture information portion of the video signal having a magnitude sufficient to cause the treated video signal to further overcompensate the automatic gain control of the video signal recording system or cause visual impairment of the reproduced picture information portion contained in a copy made of the treated video signal by said video signal recording system.

5. A method as claimed in claim 4, wherein said further pulse is from 1 to 4 microseconds in width.

6. A method as claimed in claim 4 or 5, including inserting said further pulse after at least half of the time period of the back porch of the horizontal synchronisation pulse from the end of said colour burst portion to the start of said picture information portion, has elapsed.

7. A method as claimed in any one of claims 4 to 6, including inserting said further pulse after at least the commencement of the picture information portion of the video signal within said line.

8. A method as claimed in any one of the preceding claims, including varying the point of insertion of said pulse signal within said horizontal blanking interval from line to line or from frame to frame.

9. A method as claimed in claim 8 as dependent on claim 2, including varying the point of insertion of said pulse signal within said colour burst portion from line to line or from frame to frame.

10. A method as claimed in any one of the preceding claims including varying the amplitude of said pulse signal from line to line or from frame to frame.

11. A method as claimed in any one of the preceding claims including attenuating the amplitude of the horizontal synchronisation pulse and corresponding picture information portion of the video signal during the last lines of each alternate frame sufficiently such that the overcompensation of the automatic gain control of the video recording system caused by inserting said pulse signal crushes the attenuated horizontal synchronisation pulses providing a premature emulation of the vertical synchronisation pulses.

12. A method as claimed in any of the preceding claims wherein said pulse signal is not inserted into the video signal during the horizontal blanking intervals occurring during at least the vertical synchronisation pulse and post equalisation pulse sequences of the vertical blanking interval of each frame.

13. A method for decoding a treated video signal as claimed in any one of the preceding claims, including:

clamping or switching out the dc voltages of the inserted pulse signals and opposing pulse signals in the treated video signal to the video blanking level; and

stabilising the amplitude of the synchronisation pulses.

14. A method as claimed in claim 13, including clamping or switching out the dc voltages of the inserted further pulse signals in the treated video signal to the video blanking level.

15. A method as claimed in claim 13 or 14 as dependent on claim 11, including detecting the attenuated amplitude of the horizontal synchronisation pulse and corresponding picture information portion of the last lines of the alternate frames of the treated video signal, and amplifying the amplitude of said horizontal synchronisation pulses and corresponding picture information portions to restore same to the correct video levels.

16. A method as claimed in claim 13 to 15, including:

determining the amplitude of the horizontal synchronising pulses of the treated video signal;

comparing said amplitude of the horizontal synchronisation pulses with said video blanking level; and adjusting the amplitude of the treated video signal to maintain the amplitude of said horizontal synchronisation pulses at the correct level.

17. An apparatus for treating a video signal to mitigate the ability of a video signal recording system, having an automatic gain control for adjusting the video signal level, copying an acceptable video signal for displaying therefrom, including:

receiving means to receive the video signal;

pulse generating means to generate a pulse signal of a prescribed magnitude sufficient to cause the treated video signal to overcompensate the automatic gain control of the video signal recording system when inserted into the video signal;

inserting means to insert said pulse signal into the video signal during a horizontal blanking interval of a line of the video signal; and

biasing means to bias a portion of the video signal during said horizontal blanking interval to offset the dc voltage shift caused in the video signal by said pulse signal;

wherein said inserting means is controlled to insert said pulse signal into a sufficient number of lines of the video signal to cause visual impairment of the reproduced picture information contained in a copy made of the treated video signal by said video recording system.

18. An apparatus as claimed in claim 17, wherein said inserting means is controlled to insert said pulse signal into the colour burst portion of the video signal during said horizontal blanking intervals, said pulse signal having a width sufficiently less than said colour burst portion to not affect the function of said colour burst portion during normal playing of the video signal.

19. An apparatus as claimed in claim 18 or 19, wherein said biasing means includes an opposing pulse generating means to generate an opposing pulse signal of a prescribed magnitude sufficient to achieve said offset, and said inserting means being controlled to insert said opposing pulse signal into said colour burst portion such that the resultant dc voltage level of said colour burst portion of the treated video signal is maintained at the same dc voltage level of said colour burst portion in the original video signal.

20. An apparatus as claimed in claim 19, wherein said opposing pulse signal is of a width commensurate to the remainder of the back porch of the horizontal synchronisation pulse from the commencement of said colour burst portion to the commencement of the picture information portion of the video signal and said inserting means is controlled to insert said opposing pulse signal into said back porch at the commencement of said colour burst portion.

21. An apparatus as claimed in any one of claims 17 to 20, including a further pulse generating means to generate a further pulse signal of a prescribed magnitude sufficient to cause the treated video signal to further overcompensate the automatic gain control of the video signal recording system or cause visual impairment of the reproduced picture information portion contained in a copy made of the treated video signal by said video signal recording system when inserted into the video signal, and said inserting means being controlled to insert said further pulse signal into lines of the video signal having said pulse signal, sometime after the completion of said colour burst portion and before the main displayable portion of the picture information portion of the video signal.

22. An apparatus as claimed in claim 21, wherein said further pulse is from 1 to 4 microseconds in width.

23. An apparatus as claimed in claim 21 or 22, wherein said inserting means is controlled to insert said further pulse into the video signal after at least half of the time period of the back porch of the horizontal synchronisation pulse from the end of said colour burst portion to the start of said picture information portion, has elapsed.

24. An apparatus as claimed in any one of claims 21 to 23, wherein said inserting means is controlled to insert said further pulse after at least the commencement of the picture information portion of the video signal within said line.

25. An apparatus as claimed in any one of claims 17 to 24, wherein said pulse generating means, said opposing pulse generating means or said further pulse generating means include timing means to reference said pulse generating means, opposing pulse generating means or further pulse generating means, respectively, and said inserting means for inserting said pulse signal, said opposing pulse signal or said further pulse signal

respectively, with respect to said horizontal synchronisation pulse or said colour burst portion as appropriate.

26. An apparatus as claimed in any one of claims 17 to 25, wherein said pulse generating means includes a time modulating means to vary the point of insertion of said pulse signal by said inserting means within said horizontal blanking interval from line to line or from frame to frame.

27. An apparatus as claimed in claim 26 as dependent on claim 18, wherein said time modulating means is controlled to vary said point of insertion within said colour burst portion from line to line or from frame to frame.

28. An apparatus as claimed in any one of claims 17 to 24, wherein said pulse generating means or said further pulse generating means include amplitude modulating means to vary the amplitude of said pulse signal or said further pulse signal respectively, to anywhere between the blanking level to the peak white level or further, from line to line or from frame to frame.

29. An apparatus as claimed in any one of claims 17 to 28, including an attenuating pulse generating means to generate an attenuating pulse signal and a video signal attenuating means to attenuate the video signal in response to said attenuating pulse signal, said attenuating pulse signal controlling said video signal attenuating means to sufficiently attenuate the amplitude of the horizontal synchronisation pulse and corresponding picture information portion of the video signal during the last lines of each alternate frame such that the overcompensation of the automatic gain control of the video recording system caused by the insertion of said pulse signal, crushes the attenuated horizontal synchronisation pulses providing a premature emulation of the vertical synchronisation pulses.

30. An apparatus as claimed in claim 29, wherein said attenuating pulse generating means includes an attenuating timing means to reference said

attenuating pulse generating means and said video signal attenuating means for attenuating the video signal with respect to said vertical synchronisation pulses each alternate frame.

31. An apparatus as claimed in any one of claims 17 to 30, wherein said inserting means is controlled so as to not insert said pulse signal into the video signal during the horizontal blanking intervals occurring during at lest the vertical synchronisation pulse and post-equalisation pulse sequences of the vertical blanking interval of each frame.

32. An apparatus as claimed in any one of claims 17 to 31, wherein said receiving means includes a synchronisation pulse separating means to separate the horizontal and vertical synchronisation pulses out from the video signal to provide the reference for said timing means or said attenuating timing means respectively.

33. An apparatus as claimed in claim 32, wherein said receiving means further includes a back porch clamping means to cancel any alternating current (ac) voltage component from the horizontal synchronisation pulses to ensure correct operation of said synchronisation pulse separating means.

34. An apparatus as claimed in any one of claims 17 to 33 as dependent on claim 25, wherein said timing means provides: (i) a delay of approximately 1 microsecond from the trailing edge of said horizontal synchronisation pulse before said pulse generating means is triggered to generate said pulse signal; (ii) a delay of approximately 0.5 microseconds from the trailing edge of said horizontal synchronisation pulse before said opposing pulse generating means is triggered to generate said opposing pulse signal; or (iii) a delay of approximately 5 to 7 microseconds from the trailing edge of said horizontal synchronisation pulse before said further pulse generating means is triggered to generate said further pulse signal.

35. An apparatus as claimed in any one of claims 17 to 34 as dependent on claim 30, wherein said attenuating timing means provides a delay of two frames less 5 to 15 lines of the picture information portion from the vertical synchronisation pulses of each alternate vertical blanking interval before said video signal attenuating means is triggered to attenuate the video signal.

36. An apparatus as claimed in any one of claims 17 to 35 wherein said pulse generating means generates said pulse signal having a width of approximately 0.4 microseconds and a maximum amplitude sufficient to drive the video signal into or proximate to the maximum clipping voltage level of said video signal recording system during the propagation of said pulse signal thereon.

37. An apparatus as claimed in any one of claims 17 to 36 as dependent on claim 19, wherein said opposing pulse generating means generates said opposing pulse signal having a width of approximately 7 microseconds and an amplitude opposite to and dependent upon the amplitude of said pulse signal to provide for said offset during the propagation of said opposing pulse signal on the video signal.

38. An apparatus as claimed in any one of claims 17 to 37 as dependent on claim 21, wherein said further pulse generating means generates said further pulse signal having a width of approximately 1.5 to 3 microseconds volts and a maximum amplitude sufficient to drive the video signal into or proximate to the maximum clipping voltage level of said video signal recording system during the propagation of said pulse signal thereon.

39. An apparatus as claimed in any one of claims 17 to 38 as dependent on claim 29, wherein said attenuating pulse generating means generates said attenuating pulse signal having a pulse width of approximately 5 to 15 lines of a said frame.

40. An apparatus as claimed in any one of claims 17 to 39, wherein said inserting means comprises a pulse mixer.

41. An apparatus as claimed in any one of claims 17 to 40 as dependent on claim 29, wherein said video signal attenuating means comprises a field attenuator.

42. An apparatus as claimed in any one of claims 17 to 41 including pulse tip clamping means to clamp the tips of said synchronisation pulses to the same voltage level to ensure correct horizontal synchronisation of the treated video signal.

43. An apparatus as claimed in any one of claims 17 to 42 as dependent on claim 29, wherein said video signal attenuating means adjusts the dc voltage level of the normal blanking level of the video signal throughout the attenuated portion thereof to a level of approximately 0.05 to 0.1 volts towards the synchronisation pulse tip level.

44. An apparatus for decoding a video signal treated in accordance with a method as claimed with a method as claimed in any one of claims 1 to 12, or by an apparatus as claimed in any one of claims 17 to 43, including:

decoder receiving means to receive the treated video signal;

decoder clamping means to clamp or switch out the dc voltages of the inserted pulse signals and opposing pulse signals in the treated video signal to the video blanking level; and

stabilising means to stabilise the amplitude of the synchronisation pulses.

45. An apparatus as claimed in claim 44, wherein said clamping means is adapted to clamp or switch out the dc voltages of the inserted further pulse signals in the treated video signal to the video blanking level.

46. An apparatus as claimed in claim 44 or 45 as dependent on claim 11 or claim 29, including detecting means to detect the attenuated amplitude of the horizontal synchronisation pulse and corresponding picture information portion of the last lines of the alternate frames of the treated video signal, and amplifying means to amplify the amplitude of said horizontal synchronisation pulses and corresponding picture information portions to restore same to the correct video levels.

47. An apparatus as claimed in any one of claims 44 to 46, wherein said stabilising means includes sensing means to sense the amplitude of the horizontal synchronisation pulses of the treated video signal, comparator means to compare said amplitude of the horizontal synchronisation pulses with said video blanking level, and amplitude adjusting means to adjust the amplitude of the treated video signal to maintain the amplitude of said horizontal synchronisation pulses at the correct level.

48. An apparatus as claimed in any one of claims 44 to 47, wherein said decoder receiving means includes a synchronisation pulse separating means to regenerate synchronisation pulses at the line rate of the treated video signal for use as a reference by said decoder clamping means.

49. An apparatus as claimed in any one of claims 44 to 48, wherein said decoder clamping means includes decoder timing means to delay the clamping operation of said decoder clamping means a prescribed time period after the horizontal synchronisation pulse to coincide with the propagation of the opposing pulse signal on the video signal, a decoder pulse generating means to generate a control signal for operating the clamping operation of said decoder clamping means after said delay, and a clamping amplifier to clamp the dc voltage levels of the treated video signal to the video blanking level for a prescribed time period determined by said control signal.

50. An apparatus as claimed in claim 49, wherein said prescribed time period corresponds with the period of time extending from the commencement of the propagation of said opposing pulse signal on the treated video signal to the end of the propagation of said further pulse signal.

51. An apparatus as claimed in any one of claims 44 to 50 as dependent on claim 47, wherein said amplitude adjusting means comprises an automatic gain control amplifier controlled by the output of said comparator means so as to correct any gain differences in the treated video signal arising from the detection of gain differences in said synchronisation pulse amplitudes detected by said comparator means.

52. A method for treating a video signal substantially as described herein with reference to the accompanying drawings where appropriate.

53. A method for decoding a treated video signal substantially as described herein with reference to the accompanying drawings where appropriate.

54. An apparatus for treating a video signal substantially as herein described with reference to the accompanying drawings where appropriate.

55. An apparatus for decoding a treated video signal substantially as herein described with reference to the accompanying drawings where appropriate.

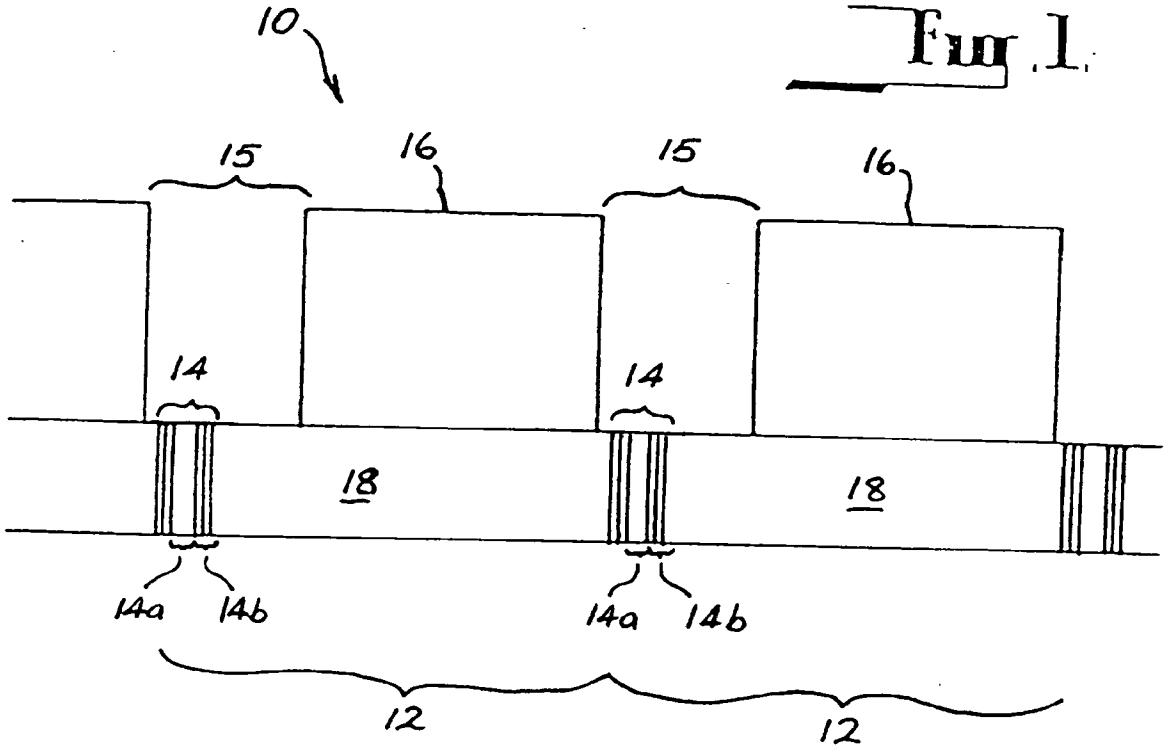

10
15
16
15
16
14
14
18
18
14a
14b
14a
14b
12
12

Fig. 1.

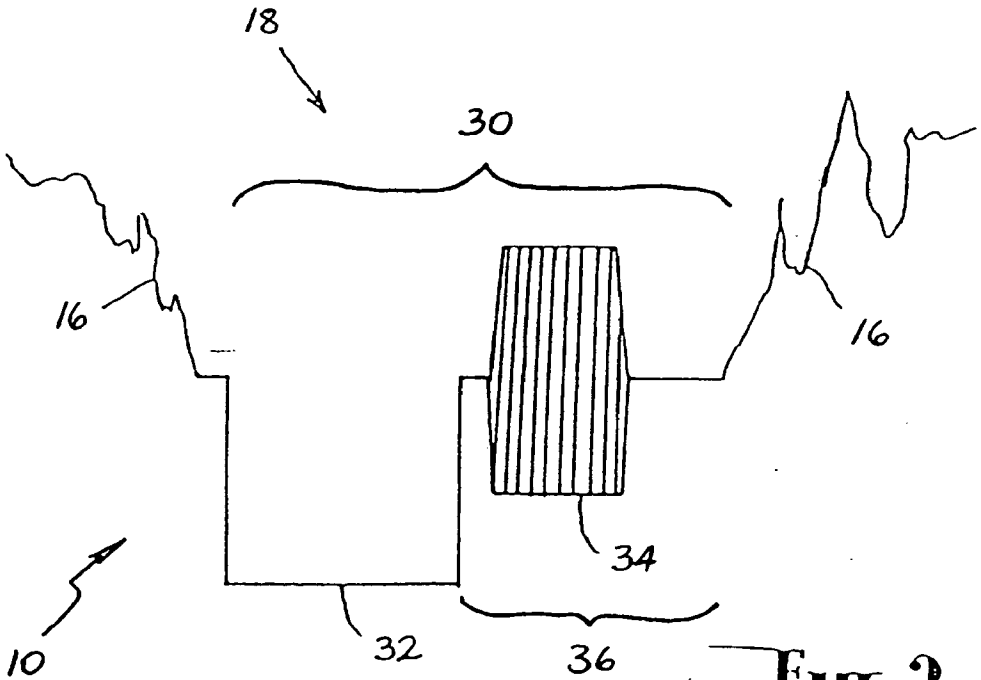

18
30
16
16
34
10
32
36

Fig. 2.

Fig. 3.

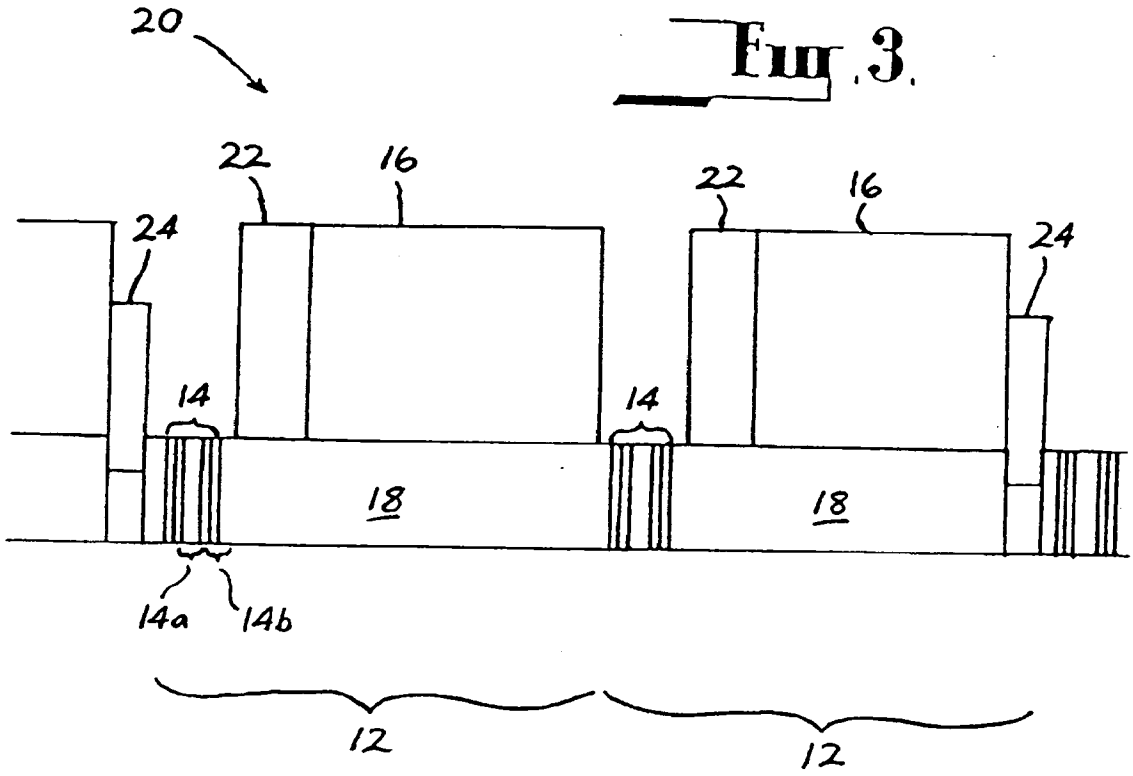
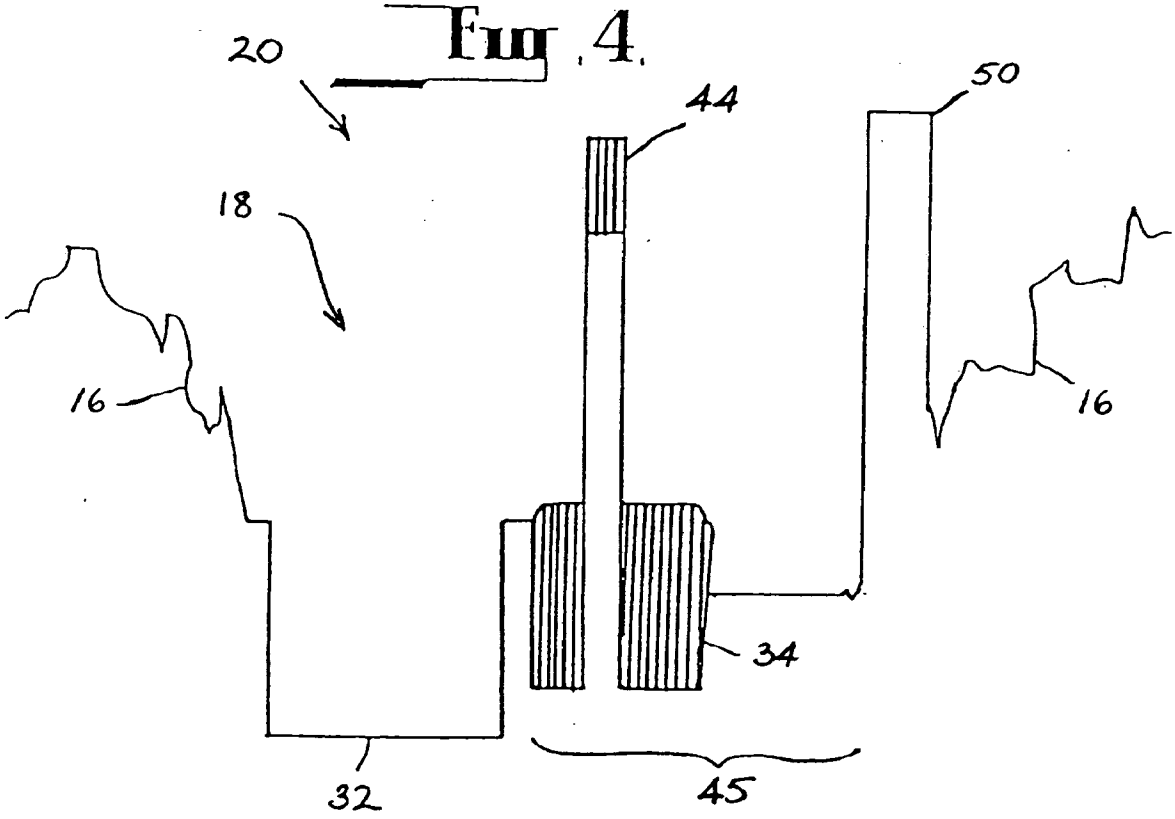

20
22
16
22
16
24
24
14
14
18
18
14a
14b
12
12

Fig. 4.


20
18
44
50
16
16
34
32
45

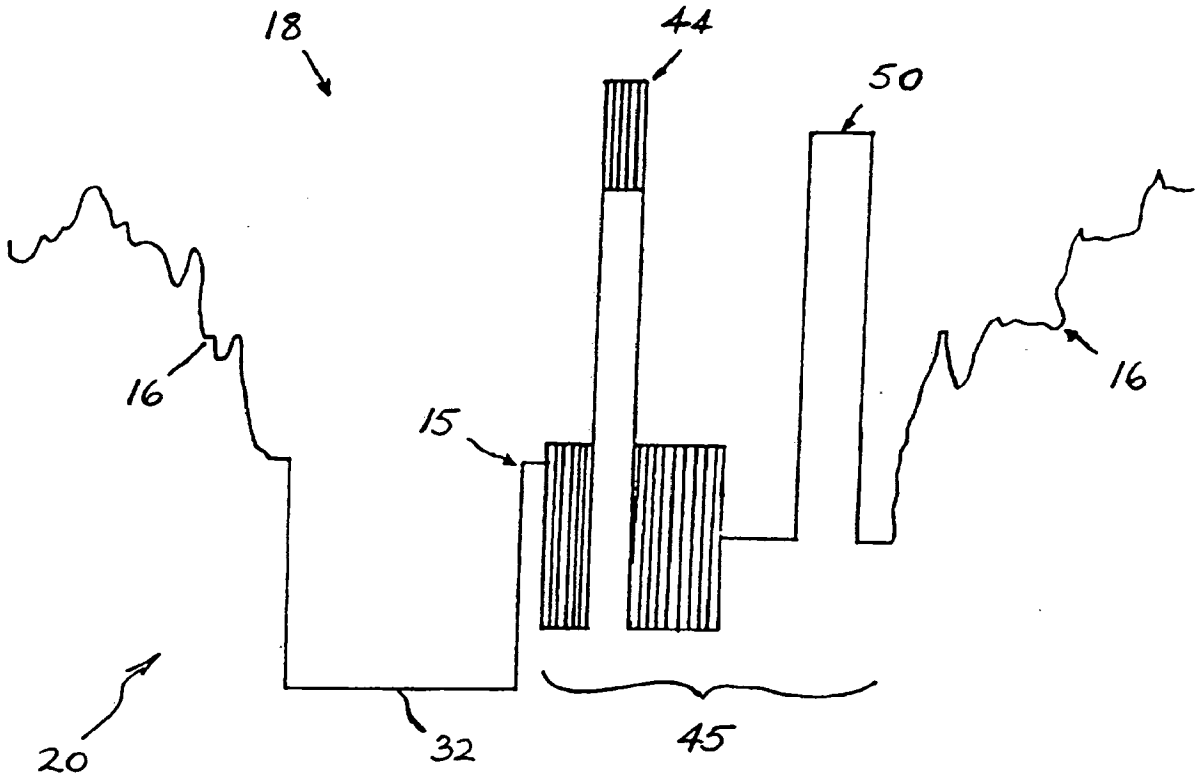


Fig 5

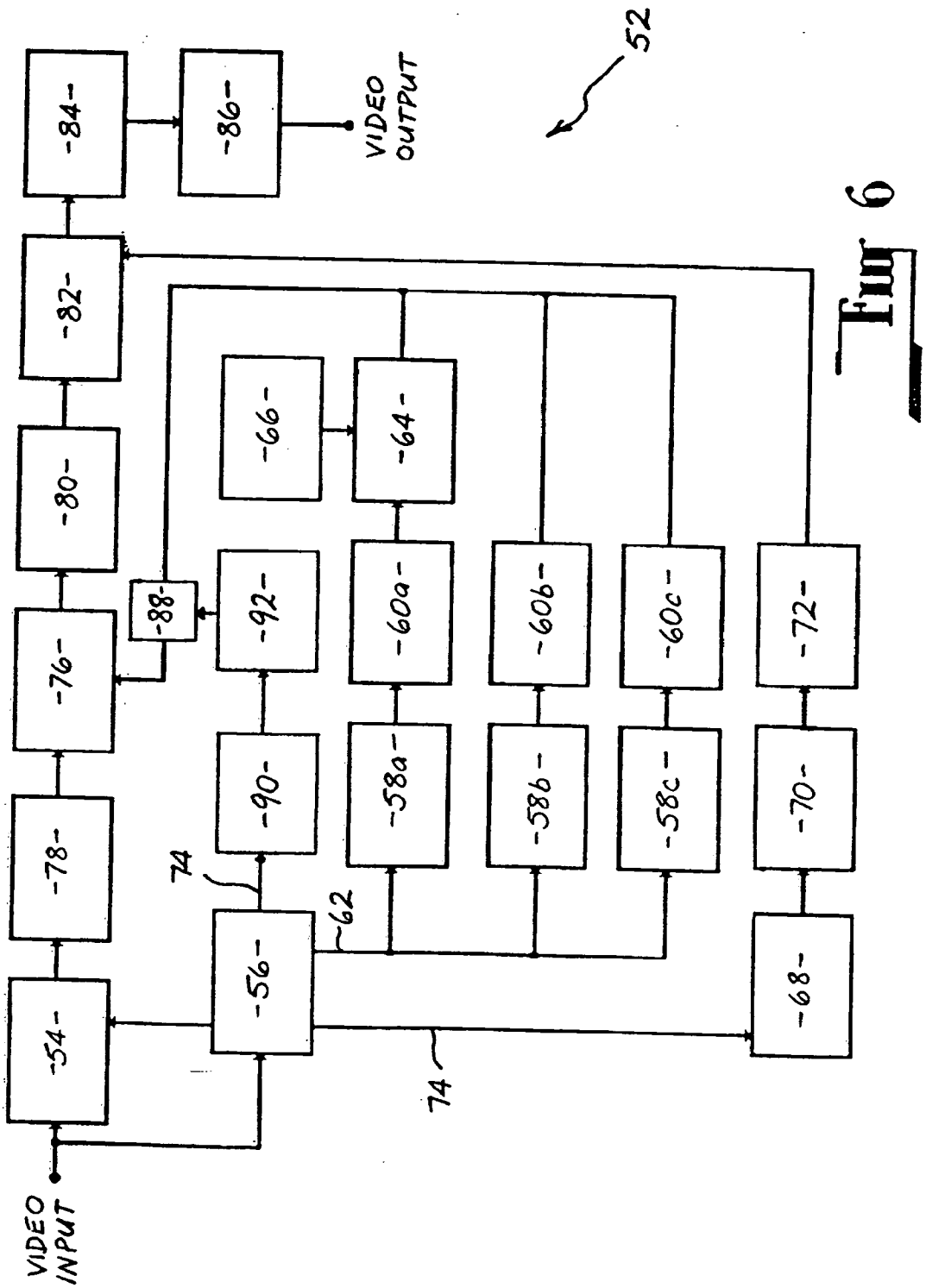

52
VIDEO OUTPUT
-84-
-86-
-82-
-80-
-76-
-78-
-54-
-56-
-88-
-92-
-90-
-66-
-64-
-60a-
-60b-
-60c-
-72-
-58a-
-58b-
-58c-
-70-
-68-
74
62
74
VIDEO INPUT

Fig 6

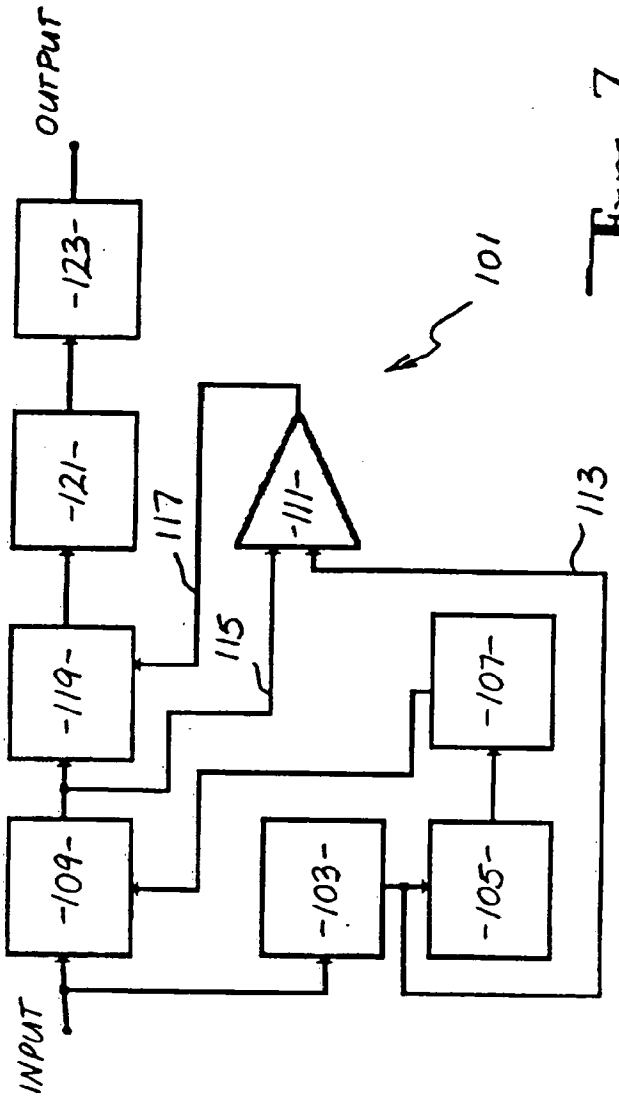


Fig 7

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/AU 96/00193

A. CLASSIFICATION OF SUBJECT MATTER

Int Cl[6]: G11B 20/02, H04N 5/76, 5/91

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC G11B 20/02, 20/04, 20/00, H04N 5/76, 5/91

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
AU: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US, A, 4163253 (MORIO et al) 31 July 1979 - see whole document	1, 17
X	WO, A, 88/02588 (TOGERETZ) 7 April 1988 - see whole document	1, 17
A	US, A, 5194965 (QUAN et al) 16 March 1993 - see whole document	1 - 55

☒ Further documents are listed in the continuation of Box C

☒ See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
17 July 1996	22 JUL 1996
Name and mailing address of the ISA/AU AUSTRALIAN INDUSTRIAL PROPERTY ORGANISATION PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No.: (06) 285 3929	Authorized officer S. LEE Telephone No.: (06) 283 2205

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/AU 96/00193

C (Continuation) **DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US, A, 5179452 (TAKAHASHI) 12 January1993 - see whole document	1 - 55
A	US, A, 4819098 (RYAN) 4 April 1989 - see whole document	1 - 55
A	US, A, 4631603 (RYAN) 23 December 1986 - see whole document	1 - 55
A	WO, A, 86/05057 (WIJNEN) 28 August 1986 - see whole document	1 - 55

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No.
PCT/AU 96/00193

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
US	4163253	DE	2712844	FR	2345877	GB	1571028
		JP	52114313	NL	7703169		
WO	8802588	NO	882231	SE	8604024		
US	5194965	US	5052261				
US	5179452	AU	20166/88	BR	8803793	CA	1337496
		EP	301504	GB	2207797	JP	1032781
US	4819098	US	5130810	US	4937679		
US	4631603	AT	48732	AU	56077/86	CA	1256558
		CN	86102600	EP	199553	ES	554085
		HK	1329/93	IN	165570	JP	61288582
		NZ	215693	PH	23758	ZA	8602491
WO	8605057	EP	214267	NL	8500515		

END OF ANNEX